OptoFidelity Video Multimeter User Manual

Version 2013Q2.0

OptoFidelity Oy • sales@optofidelity.com • www.optofidelity.com

Contents

1 General information on OptoFidelity Video Multimeter 3
2 Start window 3
3 Framerate measurement task 4
3.1 Overview tab 4
3.2 Statistics tab 6
3.3 Configuration tab 6
3.4 Color calibration 7
3.5 Saved data files 7
4 USB connection 8
5 Software update 9
6 Technical specifications 10
7 Change history 11

1 General information on OptoFidelity Video Multimeter

OptoFidelity Video Multimeter is a compact desktop solution for measuring the true and objective video playback performance of mobile, tablet or any multimedia device directly from the display. It is controlled with a touch display. This resistive touch display works best with e.g. a finger nail or a pen.

2 Start window

When power is switched on, the device starts and *Start Window* opens up. All installed applications are listed in this window. List can be browsed by dragging or with the arrow buttons on the right.

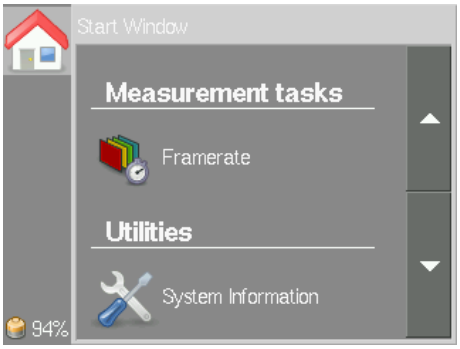

Figure 1: Start window after turning on the device.

Applications are classified according to their purpose:

- Measurement tasks: Measurement applications, which are used to determine some feature of the device under test (DUT).
- Utilities: General utility programs for using and configuring *Video Multimeter*.

3 Framerate measurement task

The framerate measurement task determines the playback smoothness of the DUT with a test video. A blinking marker is measured from the display of device, and this marker helps to determine frame intervals and missing frames. The basic measurement setup is shown in figure 2.

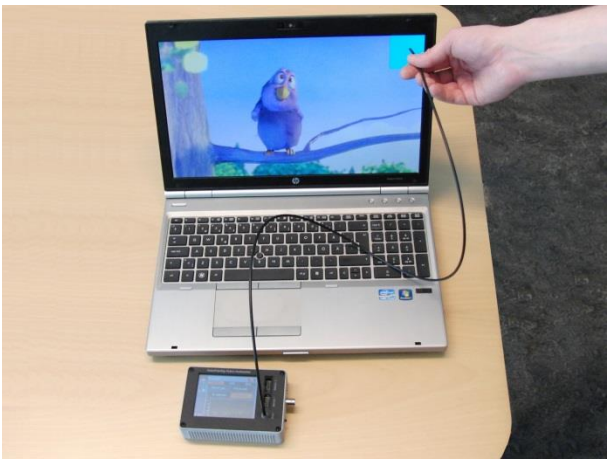

Figure 2: Example of using Video Multimeter for frame rate measurement.

3.1 Overview tab

When the frame rate measurement application is started, it opens to the overview tab shown in figure 3. On this tab, you can start and stop measurements, have an overview of the results and save them. The overview tab shows the average FPS over the whole measurement and the total number of frames.

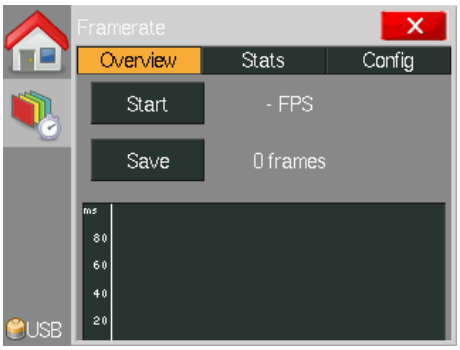

Figure 3: View of the application before measurement.

To begin a new measurement, press the start button. The measurement will start immediately and continue until you press the stop button. While the measurement is ongoing, the graph will scroll to show the results, as shown in figure 4.

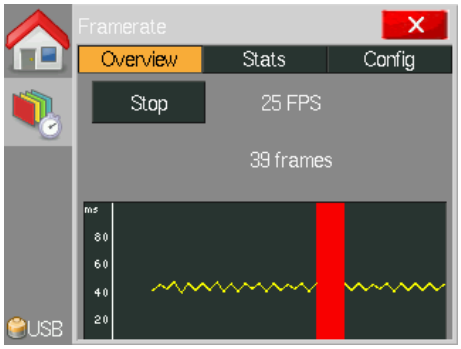

Figure 4: Frame rate measurement in progress.

The vertical axis of the graph indicates the time that each frame is on the screen. Readings on vertical axis are in milliseconds, so for example frame interval of 40 milliseconds equals to frame rate 1/0.040 = 25 FPS. Dropped frames are shown as red vertical bars if they occur.

Note: To get repeatable results, start and stop the measurement in the white period at the start and end of the video. Such videos can be generated in OptoFidelity TVG by using setting *calibration=both*.

After stopping the measurement, the results can be studied on the *Stats* tab, or saved using the *Save* button. After saving the results a message window shows the name of the saved file, like in figure 5.

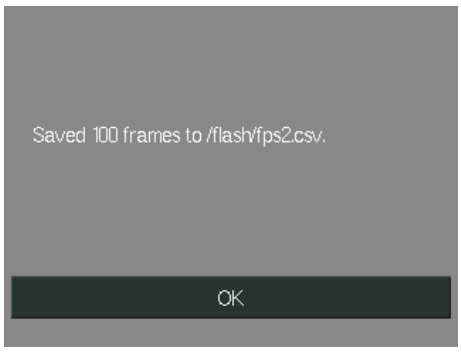

Figure 5: Message window after saving the measurement results.

3.2 Statistics tab

During or after performing a measurement, you can switch to the statistics tab to see further information. The view is shown in figure 6.

Figure 6: Statistics tab

The upper row displays the minimum, average, standard deviation and maximum values of the frame intervals. Lower row displays the total number of frames and the amount of dropped frames.

3.3 Configuration tab

By default the application uses RGB marker with built-in color calibration. This is suitable for most measurement situations with LCD displays. For other kinds of displays, adjustments on the *Config* tab may be necessary.

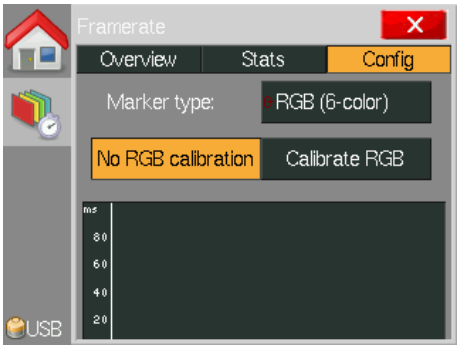

Figure 7: Configuration tab

As shown in figure 7, the configuration tab allows selection of marker type and color calibration. The available marker types are:

1. RGB (6-color): Marker with specific color sequence of 6 different colors. This measures frame intervals and detects dropped frames.
2. Black & White: Black and white marker. Simple method for testing frame intervals, but detecting dropped frames is not possible.
3. Any change: Any large change of color will be considered as a change of frame. Can measure frame intervals of any marker, but dropped frames will not be detected.

The selected marker type must match the type of the marker in the test video used.

3.4 Color calibration

The functionality of RGB marker depends on the color space of the DUT, since RGB marker is based on colors. Default settings can be applied for most LCD displays, but OLED displays and other display technologies may require calibration. You can easily see that calibration is needed, if red bars turn up on the graph constantly. This indicates that some colors have not been detected.

Calibration is performed as follows:

1. Position fiber on a color marker on display. The video must be running.
2. Press *Calibrate* button on the *Config* tab. Calibration takes few seconds and fiber must be kept still on the marker during this time.
3. New calibration is valid immediately. If required, you can do calibration again or deactivate calibration by pressing the *No calibration* button.

Note: Color calibration is only necessary for the RGB marker. It is not necessary and cannot be successfully performed for other kinds of markers.

3.5 Saved data files

The saved data files from frame rate measurement are in semicolon separated CSV format. Each row corresponds to one frame, and has the following columns:

1. Microsecond timestamp of the frame start.
2. Microsecond length of the frame (-1 for dropped frames).
3. Color of the marker in the frame.
4. Cumulative count of frames dropped since start of measurement.

	A	B	C	D
1	# Recorded at 2013-05-27 08:39:18 using OptoFidelity Video Multimeter			
2	# Timestamp (us)	Frame time (us)	Color	Total dropped frames
3	0	42560	r	0
4	42560	36640	y	0
5	79200	42560	g	0
6	121760	38620	c	0
7	160380	43550	b	0
8	203930	36620	p	0
9	240550	42590	r	0
10	283140	36620	y	0

Figure 8: Data file saved from frame rate measurement.

The CSV format is supported by e.g. Microsoft Excel and many other data analysis tools.

4 USB connection

Video Multimeter can be connected to computer by a USB cable for battery charging and data transfer. Charging will begin as soon as the USB cable is connected and is indicated by a red LED next to the USB connector. When the battery is full, the LED will turn off. Note that if the device is on, the LED will not turn off because power is being used.

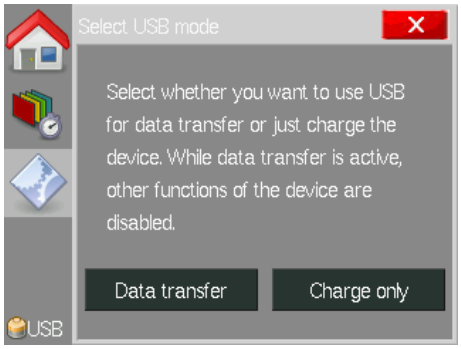
Select USB mode
Select whether you want to use USB for data transfer or just charge the device. While data transfer is active, other functions of the device are disabled.
Data transfer
Charge only
USB

Figure 9: USB mode selection screen.

When the USB cable is connected and the device is on, a selection window such as in figure 9 opens up on the display. The window has options *Data transfer* and *Charge only*. If *Data transfer* is selected, the device will appear as an USB memory on the computer. Other functions of the device will not be available while the data transfer is active. Selecting *Charge only* will simply close the dialog so that the device can be used normally while it is being charged.

5 Software update

Connect the device with USB cable to the computer to update the software. Switch the power on while holding down the button next to power switch by e.g. a pen. Device should become visible as a USB DFU device, and drivers should be installed automatically.

Start *Firmware upgrade* application by computer, and click *Start* button. Application informs when the software upgrade is done. Finally detach the device from computer and switch it off to exit the upgrade mode.

If software update is interrupted for some reason, you can run the upgrade again as described above. Upgrade mode is separate from the main software, so damaged software does not prevent upgrading.

Note: When the device is started in the firmware upgrade mode, the screen will display random noise. Reboot the device to exit the upgrade mode.

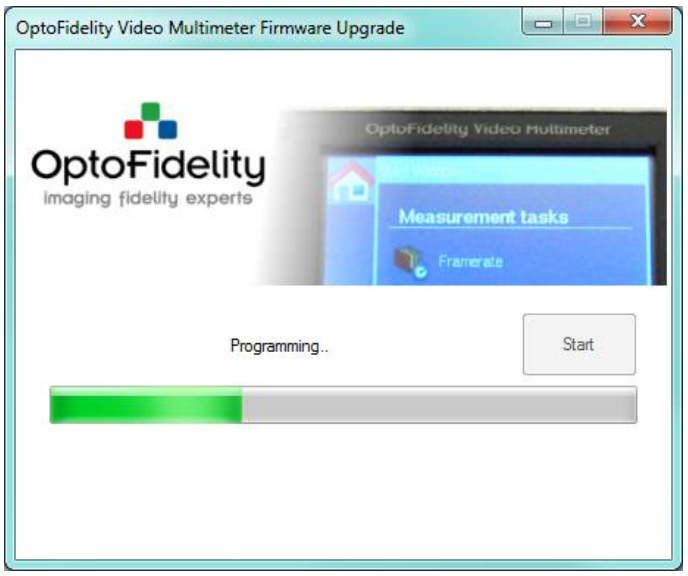

Figure 10: Firmware upgrade application.

6 Technical specifications

External dimensions:	12x8x3 cm
Operating temperature range:	-10 C to +40 C
Storage temperature range:	-20 C to +60 C
Internal memory:	4 GB
Operating time on battery:	6 hours
Battery:	Li-Ion Panasonic PA-L2, 1950 mAh, 7 Wh
Operating current:	300 mA
Built-in fiber sensor bandwidth	4 kHz
Built-in fiber sensor sample rate	100 kS/s
Synchronization output voltage (low)	0.0 V to 0.4 V
Synchronization output voltage (high)	2.9 V to 3.3 V
Synchronization output impedance	50 ohm

7 Change history

Ver.	Status	Date	Author	Remarks
1.0	Draft	5.3.2013	KRY	First release
1.1	Release	7.5.2013	JPA	Release 2013Q1.0
1.2	Release	27.5.2013	JPA	FPS UI + file format